

## 2.0 ALTERNATIVES

The development of alternatives for the Gravina Access Project has been an evolving process to identify the location and type of crossing of Tongass Narrows that would best meet the purpose of and need for the project. The DOT&PF reviewed previous engineering studies, conducted detailed engineering and environmental studies, and obtained input from the Ketchikan community and local, state, and federal agencies, Tribes, and other Native organizations in developing the project alternatives. This chapter describes the ten project alternatives evaluated in this EIS and identifies the DOT&PF's preliminary preferred alternative for the project. It also identifies alternatives that were initially considered as conceptual build options and the reasons they were eliminated from further consideration.

### 2.1 ALTERNATIVES EVALUATED IN THIS EIS

During the spring of 2000, the DOT&PF developed 18 build concepts for crossing Tongass Narrows. These concepts were based on previous studies, input from agencies and the public, engineering analysis, and the objectives in the purpose and need statement for the project (see Chapter 1). The build concepts consisted of 11 bridge options, two tunnel options, one tunnel-and-bridge option, and four supplemental ferry options (see Figure 2.1. Note: All referenced figures in this Chapter 2 are at the end of the chapter.); a No Action Option was also under consideration during this initial phase. These initial options were reviewed with input from the Ketchikan community and local, state, and federal agencies, Tribes and other Native organizations, to identify reasonable alternatives for the Gravina Access Project (see Section 2.3). Factors related to the ability to meet the project purpose and need, cost, environmental impacts, impacts to 4(f) properties, and transportation impacts were examined for each of the initial options and those options that were not considered practical or feasible from a technical and economic standpoint were eliminated from further consideration (see Section 2.2).

Additional technical studies and public and agency input resulted in the identification of nine reasonable build alternatives and the No Action Alternative for the Gravina Access Project. Sections 2.1.1 through 2.1.3 describe the reasonable alternatives that are evaluated in detail in this EIS: the No Action Alternative; six bridge alternatives, C3(a), C3(b), C4, D1, F1, and F3; and three ferry alternatives, G2, G3, and G4. The descriptive name of each of alternative includes the crossing's "takeoff" point on Revillagigedo Island and/or the "touchdown" location on Gravina Island.

Table 2-1 provides a summary of the key features of the reasonable project alternatives and Figure 2.2 shows the alignments of the reasonable alternatives. Typical cross-sections of the proposed roadway and bridges are shown in Figure 2.3. Figure 2.4 shows the configuration of the Ketchikan International Airport access road and parking facilities, which are common to all build alternatives. All build alternatives (bridges and ferries) include a parking structure and access improvements to accommodate additional traffic to the airport resulting from improved access. The total cost for this future airport development is estimated to at \$11 million—\$3 million for program development costs and \$8 million for construction costs. Other figures (as noted in the following descriptions of project alternatives) depict the alignment of each alternative individually.

The current fund source for the project is high-priority project funding (approximately \$20.4 million) appropriated in TEA-21. This funding is expected to cover much of the initial project

development cost, including preparation of the environmental documentation and design effort. DOT&PF has committed to provide the required 20 percent matching funds for these initial phases. Funding for complete project construction cost, both federal and state funds, has not yet been identified. Any improvements constructed as a result of the Gravina Access Project will become a state facility that will be maintained and operated by DOT&PF. DOT&PF has committed to cover the annual costs of operation and maintenance.

**TABLE 2-1  
SUMMARY OF DESCRIPTIONS OF REASONABLE ALTERNATIVES**

<i>Parameter</i>	<i>No Action Alt.</i>	<i>Bridge Alternatives</i>						<i>Ferry Alternatives</i>		
		<i>C3(a)</i>	<i>C3(b)</i>	<i>C4</i>	<i>D1</i>	<i>F1</i>	<i>F3</i>	<i>G2</i>	<i>G3</i>	<i>G4</i>
Crossing Location	2.8 mi north of downtown	1,600' north of airport terminal	2,600' north of airport terminal	1,600' north of airport terminal	Due east of airport terminal	1.4 mi. south of downtown	1.5 mi. south of downtown	2 mi north of airport terminal	1.3 mi south of airport terminal	2.8 mi north of downtown
Bridge Dimensions:										
Bridge Length (feet)	—	5,690	4,250	4,980	3,220	6,470	5,400	—	—	—
Maximum Height (feet)	—	250	195	250	160	E: 250 W:160	E: 140 W: 250	—	—	—
Vertical Clearance (feet)	—	200	120	200	120	E: 200 W:120	E: 60 W: 200	—	—	—
Horizontal Clearance (ft)	—	550	500	550	500	E: 550 W: 500	E: 500 W: 550	—	—	—
Aviation Zone Intrusion?	No	Yes	No	Yes	No	No	No	No	No	No
Block Cruise Ships?	—	No	Yes	No	Yes	No	No	No	No	No
Additional Ferry Service:										
New Terminals (Number)	—	—	—	—	—	—	—	2	2	2
New Vessels (Number)	—	—	—	—	—	—	—	2	2	2
New Roadway Length (feet):	—	20,070	20,970	19,660	18,210	42,100	35,370	18,920	20,300	16,670
Travel Time to Airport from Downtown Ketchikan (minutes)	27	14	12	11	11	13	13	42	35	25
Estimated Costs (\$ million):										
Construction	0	145	125	145	100	170	155 <sup>1</sup>	45	45	40
Program Development <sup>2</sup>	0	55	45	50	35	60	55	15	20	15
Totals	0	200	170	195	135	230	205	60	70 <sup>3</sup>	60 <sup>3</sup>
Average Annual Operation & Maintenance	2.09	0.15	0.16	0.15	0.13	0.11	0.11	4.98	4.98	4.97
50-year Life-Cycle	10	160	135	160	105	190	170	90	100	90

<sup>1</sup> Assumes channel modification would be required.

<sup>2</sup> Includes right-of-way acquisition costs.

<sup>3</sup> Numbers have been rounded; totals are not a direct sum.

### 2.1.1 No Action Alternative



The National Environmental Policy Act (NEPA) requires an EIS to describe and analyze the impacts of no action, as a benchmark that enables comparison of the magnitude of the environmental effects of the various project alternatives.<sup>1</sup>

Under the No Action Alternative, no bridge would be constructed and no additional ferry service would be provided between Revillagigedo Island and Gravina Island. The only public access between the islands would continue to be provided by the existing airport ferry service across Tongass Narrows, private boats, and floatplanes. On Revillagigedo Island, the existing

ferry terminal is located 2.8 miles north of downtown Ketchikan; on Gravina Island, the terminal is on the waterfront, just east of the airport terminal. The No Action Alternative is shown on Figure 2.5.

The Borough operates the airport ferry service. The ferry service would continue to operate 16 hours per day and the frequency of service would remain the same, with departures every 30 minutes in winter and every 15 minutes in summer. The Borough has acquired a provisional permit from the COE for construction of a new road around the west side of the airport to the Lewis Reef development area (i.e., Proposed Ketchikan Airport Access Road shown in Figure 2.2). At this time, funding has not been secured for construction of the road. If the road were constructed, the ferry schedule could change to accommodate passengers to land other than at the airport.

**Cost.** Although this alternative would have no new construction costs, the estimated 50-year life-cycle cost would be approximately \$10 million, and the estimated average annual operation and maintenance (O&M) cost for the 50-year life cycle would be approximately \$2.09 million (see Appendix A). The estimates were based on replacing ferry vessels after 50 years of service and replacing the engines after 25 years.

### 2.1.2 Bridge Alternatives

The following sections describe the six bridge alternatives evaluated in this EIS. The alignments of the six bridge alternatives are shown on Figures 2.6, 2.7, 2.8, 2.9, 2.10, and 2.11. Bridge profile sheets, showing cross-sectional views of the bridges, navigational openings, roadway gradients, and conceptual design, are provided in Figure 2.12 (for Alternatives C3[a] and C3[b]), Figure 2.13 (for Alternatives C4 and D1), and Figure 2.14 (for Alternatives F1 and F3). Note that the existing airport ferry service would be discontinued under all of the bridge alternatives.

<sup>1</sup> Council on Environmental Quality, *Forty Most Asked Questions Concerning CEQ's NEPA Regulations*, 46 Fed. Reg. 18026 (March 23, 1981), as amended, 51 Fed. Reg. 15618 (April 25, 1986).

### 2.1.2.1 Alternative C3(a): 200-foot Bridge Between Signal Road and South of Airport Terminal

**Bridge Structure.** Alternative C3(a) includes a bridge across Tongass Narrows approximately 1,600 feet north of the airport terminal. The bridge would be 5,690 feet long, and have a maximum height of approximately 250 feet. The main span of the bridge would have a vertical navigational clearance of 200 feet above high tide and a horizontal navigational clearance of approximately 550 feet (see Figure 2.12). The main span of the bridge would be centered on the cruise ship tracklines and would be over water with depths in excess of 40 feet (at low tide) to accommodate deep draft vessels. These clearances would accommodate one-way passage of cruise ships and two-way passage of most other ships (including Alaska Marine Highway System [AMHS] ferries).



Alternative C3(a) bridge from north of Wolf Point on Tongass Avenue, looking south

**Alignment.** The alignment of Alternative C3(a) is shown in Figure 2.6. On Revillagigedo Island, the alignment would connect to Signal Road at North Tongass Avenue. The connection at North Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the alignment would traverse the hillside southward, gain elevation, and turn southwestward. The bridge would cross Tongass Avenue and Tongass Narrows, and then turn southward to parallel the airport runway and touch down (reach the ground surface) on Gravina Island south of the terminal. A 0.4-mile-long airport return loop road would connect the airport terminal and the bridge terminus. The main road would continue around the southern end of the airport runway and then arc northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. At the southern end of the runway, the road would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$160 million. The estimated average annual O&M cost is approximately \$150,000 (see Appendix A).

### 2.1.2.2 Alternative C3(b): 120-foot Bridge Between Signal Road and Airport Terminal



Alternative C3(b) bridge from north of Wolf Point on Tongass Avenue, looking south

**Bridge Structure.** The Alternative C3(b) bridge would be approximately 4,250 feet long, and have a maximum height of approximately 195 feet. The main span of this bridge would have a vertical navigational clearance of 120 feet above high tide and a horizontal navigational clearance of approximately 500 feet (see Figure 2.12). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate passage of AMHS ferries, but not larger cruise ships.

**Alignment.** The alignment of Alternative C3(b) is shown on Figure 2.7. Alternative C3(b) would have the same general alignment on Revillagigedo and Gravina Islands as Alternative C3(a), however, with a lower bridge profile. The position of the C3(b) bridge over Tongass Narrows and at its touchdown on Gravina Island (near the airport terminal) would be north of the C3(a) alignment. This alternative would not need an airport return loop road because the bridge would touch down in front of the airport terminal. The connection at North Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$135 million. The estimated average annual O&M cost is approximately \$160,000 (see Appendix A).

### 2.1.2.3 Alternative C4: 200-foot Bridge Between Tongass Avenue North of Cambria Drive and South of Airport Terminal

**Bridge Structure.** The Alternative C4 bridge would be approximately 4,980 feet long and have a maximum height of approximately 250 feet. The main span of this bridge would have a vertical navigational clearance of 200 feet and a horizontal navigational clearance of approximately 550 feet (see Figure 2.13). The main span of the bridge would be centered on the cruise ship tracklines and would be over water with depths in excess of 40 feet (at low tide) to accommodate deep draft vessels. These clearances would accommodate one-way passage of cruise ships and two-way passage of most other ships, including AMHS ferries.



Alternative C4 bridge from north of Wolf Point on Tongass Avenue, looking south

**Alignment.** The alignment of Alternative C4 is shown on Figure 2.8. On Revillagigedo Island, the alignment would connect to Tongass Avenue north of Cambria Drive, across from the access to the existing ferry terminal. The connection at Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, Alternative C4 would extend northward and traverse the hillside around the quarry; the bridge would cross over Tongass Avenue and Tongass Narrows, turn southward to parallel the airport runway, and then touch down on Gravina Island south of the airport terminal. A 0.4-mile-long airport return loop road would connect the airport terminal and the bridge terminus. The main road would continue around the southern end of the airport runway and then arc northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. At the southern end of the runway, the road would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$160 million. The estimated average annual O&M cost is approximately \$150,000 (see Appendix A).

#### 2.1.2.4 Alternative D1: 120-foot Bridge Between Tongass Avenue at Cambria Drive and Airport Terminals



Alternative D1 bridge from near Wolf Point on Tongass Avenue, looking south

**Bridge Structure.** The Alternative D1 bridge would cross Tongass Narrows directly east of the airport terminal. The bridge would be approximately 3,220 feet long and have a maximum height of approximately 160 feet. The main span of this bridge would have a vertical clearance of 120 feet above high tide and a horizontal clearance of 500 feet (see Figure 2.13). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate passage of AMHS ferries, but not larger cruise ships.

**Alignment.** The alignment of Alternative D1 is shown on Figure 2.9. On Revillagigedo Island, the alignment would connect to Tongass Avenue at Cambria Drive near the existing airport ferry terminal. The connection at Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the alignment would rise along the hillside and turn westward; the bridge would cross over Tongass Avenue and Tongass Narrows, and then turn southward to parallel the shoreline on Gravina Island and touch down south of the airport terminal. A 0.4-mile-long airport return loop road would connect the airport terminal and the bridge terminus. The main road would continue around the southern end of the airport runway and then arc northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. At the southern end of the runway, the road would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$105 million. The estimated average annual O&M cost is \$130,000 (see Appendix A).

#### 2.1.2.5 Alternative F1 (Preferred): Bridges (200-foot East and 120-foot West) Between Tongass Avenue and Airport, via Pennock Island

**Bridge Structures.** Alternative F1 would cross Tongass Narrows via Pennock Island with two bridges. One bridge would cross the East Channel and the other would cross the West Channel. The East Channel bridge would be approximately 3,715 feet long and have a maximum height of approximately 250 feet. The bridge would have a vertical navigational clearance of 200 feet above high tide and a horizontal navigational clearance of approximately 550 feet (see Figure 2.14). The main span of the bridge would be centered on the cruise ship tracklines and would be over water with depths in excess of 40 feet (at low tide) to accommodate deep draft vessels. These



Alternative F1 bridges and Pennock Island from mid-Tongass Narrows near the airport, looking south



clearances would accommodate one-way passage of cruise ships and two-way passage of



Alternative F1 200-foot bridge from cruise ship dock, looking south

most other ships, including AMHS ferries. The West Channel bridge would be approximately 2,750 feet long and have a maximum height of approximately 160 feet. The bridge would have a vertical navigational clearance of 120 feet above high tide and a horizontal navigational clearance of approximately 500 feet (see Figure 2.14). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate passage of AMHS ferries, but not larger cruise ships.

**Alignment.** The alignment of Alternative F1 is shown in Figure 2.10. On Revillagigedo Island, Alternative F1 would connect to Tongass Avenue just south of Tatsuda's grocery store and near the southern end of the quarry. The connection at South Tongass Highway would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the alignment would rise to the southeast along the hillside (and east of the tank farm, the cemetery, and the USCG Station), turn westward (skirting the southern end of the USCG Station property, north of the Forest Park subdivision) and cross over Tongass Avenue approximately 1.4 miles south of downtown Ketchikan, then cross the East Channel to Pennock Island. The roadway would cross Pennock Island at grade. From Pennock Island, the West Channel bridge would cross to Gravina Island, touching down approximately 2.7 miles south of the airport runway. The road would continue northward approximately 4.9 miles to the northern end of the Airport Reserve zone. A 1.2-mile airport access road would be constructed at the southern end of the airport runway. The airport access roadway would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$190 million. The estimated average annual O&M cost is approximately \$110,000 (see Appendix A).

#### 2.1.2.6 Alternative F3: Bridges (60-foot East and 200-foot West) Between Tongass Avenue and Airport, via Pennock Island

**Bridge Structures.** Similar to Alternative F1, Alternative F3 would have two bridges that cross Tongass Narrows via Pennock Island. One bridge would cross East Channel and the other bridge would cross West Channel. The East Channel bridge would be approximately 2,065 feet long and have a maximum height of approximately 140 feet. The bridge would have a vertical navigational clearance of 60 feet above high tide, (lower than any of the other bridges), and a horizontal clearance of approximately 500 feet (see Figure 2.14). The



Alternative F3 60' bridge over East Channel from south of USCG Station on Tongass Avenue, looking north

main span would be located over water with depths in excess of 40 feet at low tide. These clearances would not accommodate passage of AMHS ferries or taller cruise ships, which currently use the East Channel as their primary navigational route. The West Channel bridge

would be approximately 3,270 feet long and have a maximum height of approximately 250 feet. The bridge would have a vertical navigational clearance of 200 feet above high tide and a horizontal navigational clearance of approximately 550 feet (see Figure 2.14). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate one-way passage of cruise ships and two-way passage of most other ships, including AMHS ferries.



Alternative F3 bridges and Pennock Island from mid-Tongass Narrows near the airport, looking south

**Alignment.** The alignment of Alternative F3 is shown in Figure 2.11. On Revillagigedo Island, the East Channel bridge would connect to South Tongass Highway, approximately 1.5 miles south of downtown Ketchikan between the USCG Station and the Forest Park subdivision. The connection at South Tongass Highway would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the bridge would cross the East Channel to Pennock Island. The roadway would

cross Pennock Island at grade. From Pennock Island, the West Channel bridge would cross to Gravina Island, touching down approximately 2.7 miles south of the airport runway. The road would continue northward approximately 4.9 miles to the northern end of the Airport Reserve zone. A 1.2-mile airport access road would be constructed at the southern end of the airport runway. The airport access roadway would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

**Channel Widening Option.** In response to concerns expressed by cruise ship pilots, DOT&PF proposes widening a portion of the West Channel to improve its navigational characteristics and mitigate adverse impacts to cruise ships transiting the West Channel. The channel widening would occur in the narrowest part of the West Channel (see Figures 2.15 and 2.16). Currently, the width of the navigable portion of West Channel (i.e., with respect to large cruise ships) is approximately 400 feet at its narrowest point with a minimum depth of 40 feet below low water. With the proposed channel modifications, this portion of the West Channel would have a channel width of 750 feet: the center 550 feet would have a minimum depth of 40 feet below low water and both sides of the channel would have a minimum depth of 30 feet below low water. The deepest part of the channel would be centered on the navigational opening of the West Channel bridge.

The bridge would be located at the southern end of the widened channel, which would extend approximately 2,000 feet north of the bridge. South of the bridge crossing, and north of the channel improvement area, the existing channel is wider and deeper than the proposed improved channel.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$150 million. The estimated average annual O&M cost is approximately \$110,000. With the channel modifications, the estimated 50-year life-cycle cost of this alternative would be approximately \$170 million (see Appendix A).



### 2.1.3 Ferry Alternatives

The alignments of the three ferry alternatives are shown on Figures 2.17, 2.18, and 2.19. Each of the ferry alternatives would augment the existing airport ferry service, with the existing ferry service continuing to operate at its current location and under its current schedule. Each ferry alternative would include two new ferry vessels (similar to the most recently constructed airport ferry vessel), a new ferry terminal on Revillagigedo Island, and a new ferry terminal on Gravina Island (similar to the existing ferry terminals). Figure 2.20 is a conceptual drawing of a typical ferry terminal layout. The schedule of the new ferry service under each alternative would be similar to that of the existing ferry service: one vessel would operate during the winter (16 hours per day, crossing every 30 minutes), and both vessels would operate during the summer (also 16 hours per day, crossing every 15 minutes).

#### 2.1.3.1 Alternative G2: Ferry Between Peninsula Point and Lewis Point

Alternative G2 would be a new ferry service for vehicles and passengers between Peninsula Point on Revillagigedo Island and Lewis Point on Gravina Island, crossing Tongass Narrows approximately 2 miles north of the airport (see Figure 2.17).



Alternative G2 ferry from Gravina Island shoreline near the northern end of the airport runway, looking north

**Facilities and Roadway.** This alternative would require construction of a new ferry terminal on each side of Tongass Narrows and two new ferry vessels. A 4.3-mile road would be constructed on Gravina Island that would extend from the ferry terminal southward approximately 2.6 miles, wrap around the southern end of the airport runway, and then turn northward to the airport terminal. The road at the southern end of the runway would be constructed at a grade low enough to allow for planned future expansion of the runway, with the runway extended as an overpass of the road.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$90 million, and its estimated average annual O&M cost is approximately \$4.98 million (see Appendix A).

#### 2.1.3.2 Alternative G3: Ferry Between Downtown and South of Airport



Alternative G3 ferry from the north parking area adjacent to Plaza Port West, looking northwest toward Gravina Island

Alternative G3 would be new ferry service for vehicles and passengers between Ketchikan (near the Plaza Mall at Jefferson Street) on Revillagigedo Island and a location approximately 0.6 miles south of the airport runway on Gravina Island (see Figure 2.18).

**Facilities and Roadway.** This alternative would require construction of a new ferry terminal on each side of Tongass Narrows and two new ferry vessels. Dredging may be required to provide adequate navigational depths for the ferry

terminal on Revillagigedo Island. The existing breakwater could also be widened and extended

for use as the ferry terminal pier. A road would be constructed on Gravina Island from the ferry terminal northward approximately 3.0 miles to the northern end of the Airport Reserve zone. A 1.2-mile airport access road would be constructed around the southern end of the airport. The road at the southern end of the runway would be constructed at a grade low enough to allow for future planned expansion of the runway, with the runway extended as an overpass of the road.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$100 million, and its estimated average annual O&M cost is approximately \$4.98 million (see Appendix A).

#### **2.1.3.3 Alternative G4: Ferry Between New Terminals Adjacent to Existing Terminals**

Alternative G4 would be new ferry service for vehicles and passengers adjacent to the existing airport ferry route, crossing Tongass Narrows 2.8 miles north of downtown (see Figure 2.19).

**Facilities and Roadway.** This alternative would require construction of a new ferry terminal on each side of Tongass Narrows, adjacent to the existing airport ferry terminals, and two new ferry vessels. A 3.2-mile road would be constructed on Gravina Island that extends southward from the airport ferry terminals; the roadway would wrap around the southern end of the airport runway, and then turn northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. The road at the southern end of the runway would be constructed at a grade low enough to allow for future planned expansion of the runway, with the runway extended as an overpass of the road.

**Cost.** The estimated 50-year life-cycle cost of this alternative is approximately \$90 million, and its estimated average annual O&M cost is approximately \$4.97 million (see Appendix A).

#### **2.1.4 Selection of Preliminary Preferred Alternative**

Based on the analyses of alternatives presented in this EIS and public and agency input, the DOT&PF determined Alternative F1 to be its preliminary Preferred Alternative for the following reasons.

**Improved Access to Gravina Island:** Alternative F1 improves convenience and reliability of access to Ketchikan International Airport and developable and recreation lands on Gravina Island by providing a hard link between Revillagigedo Island and Gravina Island. The travel time between the airport and downtown Ketchikan using Alternative F1 would be approximately 14 minutes faster than the travel time using the existing airport ferry. Although the travel times for the existing ferry and Alternative F1 between the airport and areas north of downtown Ketchikan are essentially the same, Alternative F1 would provide unlimited access for travel between the islands 24 hours per day, whereas ferry access is limited to a 16-hour-per-day schedule with two to four transits per hour, depending on the season.

**Economic Impacts:** Because Alternative F1 would allow the continued safe passage of large cruise ships northbound and southbound through Tongass Narrows and East Channel, there would be no reduction in cruise ship port calls in Ketchikan and, therefore, no reductions in cruise-related spending, which is a major component of Ketchikan's economy.

**Navigational Requirements for Tongass Narrows:** Alternative F1 would allow the continued passage of large cruise ships northbound and southbound through Tongass Narrows and East Channel, and the continued separation of cruise ship traffic (East Channel) from the AMHS and other marine traffic (West Channel). Alternative F1 is preferable to the other alternatives from a navigation safety standpoint because it would not contribute to conflicts at the navigational choke point next to Ketchikan International Airport and Alaska Ship and Drydock (as would Alternatives C3(a), C3(b), C4, and D1) and it would not require additional ship maneuvers or cause increased navigational risk for cruise ships transiting West Channel (as would Alternative F3).

**Aviation Impacts:** Alternative F1 would not penetrate any airspace surfaces associated with Ketchikan International Airport. Alternative F1 would not hinder any future growth or improvements to the Ketchikan International Airport. Floatplane facilities at Ketchikan International Airport and waterways designated for floatplane take-offs and landings in Tongass Narrows would not be affected by Alternative F1.

**Consistency with the Borough's Long-term Plans for Gravina Island:** Alternative F1 would be consistent with the Borough's plans for long-term development on Gravina Island. Projections for development on Gravina Island are highest for Alternatives F1 and F3. Alternative F1 would promote development of Gravina Island, as well as Pennock Island, thereby enhancing economic development in the Borough.

**Access to Borough Land on Pennock Island:** Alternative F1 provides the additional benefit of access to Pennock Island, which contains a substantial amount of the Ketchikan Gateway Borough's land base.

**Marine Habitat Impacts:** Pier placement for Alternative F1 would potentially affect kelp and/or eelgrass beds at one pier location in West Channel, however, there would be no requirements for channel modification. Alternative F1 would have the least impact of all of the alternatives on Essential Fish Habitat (EFH), with the exception of Alternative G4, which would affect 0.1 acre less than Alternative F1.

All reasonable alternatives under consideration (including the No Action Alternative) have been developed to a comparable level of detail in the EIS and their comparative merits have been evaluated. The final selection of an alternative will not be made until the alternatives' impacts and comments on the EIS and from public hearings have been fully evaluated.

## **2.2 ALTERNATIVES PREVIOUSLY CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION**

This section describes options for crossing Tongass Narrows that were originally considered as possible alternatives for the Gravina Access Project. These alternatives were eliminated from further consideration based on cost and/or environmental factors. The costs for these preliminary options were developed in the late winter and early spring of 2000 and were based on preliminary engineering information (see Appendix A, page 2). These costs cannot be directly compared with the costs of the reasonable alternatives described in Section 2.1, which are based on additional engineering and environmental studies completed since the spring of 2000.

### **2.2.1 Bridge Options**

The following paragraphs describe six bridge options that were initially developed for the Gravina Access Project but were determined not to be reasonable and eliminated from further consideration based on cost factors. All of these bridge options assumed that the existing airport ferry service would be discontinued. Vertical and horizontal clearances indicate the dimensions of the primary navigational opening for each bridge, which would constrain the size of ships that could pass under the bridge.

#### **2.2.1.1 Option A—High-Level Bridge from Refuge Cove Area**

This bridge would start at Mile 8.5 of Tongass Avenue near Refuge Cove and touch down on Gravina Island 2.7 miles north of the airport. The bridge would be about 1.5 miles long, have a vertical clearance of 210 feet and a horizontal clearance of 750 feet, and connect to a roadway to the airport. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$260 million.

#### **2.2.1.2 Option B—High-Level Bridge from Peninsula Point Area**

This bridge would start at Mile 5.5 of Tongass Avenue near Murphy's Landing and touch down on Gravina Island north of the Seeley Corporation timber processing plant. The bridge would be about 1.4 miles long, have a vertical clearance of 210 feet and a horizontal clearance of 750 feet, and connect to a roadway to the airport. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$370 million.

#### **2.2.1.3 Option C1—High-Level Bridge to Airport Area North**

This bridge would start at Tongass Avenue north of the existing airport ferry terminal, rise along the hillside behind the quarry, turn westward, cross over Tongass Avenue and Tongass Narrows, and then turn northward just east of the airport to parallel the airport runway as it descends on Gravina Island. The bridge would be about 1.7 miles long, and have a vertical clearance of 210 feet and a horizontal clearance of 750 feet. The road would terminate north of the airport, at the boundary between the Airport Reserve zone (the area immediately surrounding Ketchikan International Airport) and the Airport Development zone (the area around the Airport Reserve zone), and would include an exit to the airport terminal. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$235 million.

#### **2.2.1.4 Option C2—High-Level Bridge to Airport Area South**

This bridge would start at Tongass Avenue south of the existing airport ferry terminal, rise northward along the hillside behind the quarry, turn westward, cross Tongass Avenue and Tongass Narrows, and then turn southward just east of the airport to parallel the runway as it descends on Gravina Island. The bridge would be about 1.5 miles long, with a vertical clearance of 210 feet and a horizontal clearance of 750 feet. The road would terminate south of the airport, at the boundary between the Airport Reserve zone and the Airport Development zone, and would include an exit to the airport terminal. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$200 million (see Section 2.3.6 for the discussion regarding the increased cost ceiling).

#### **2.2.1.5 Option D2—Low-Level Moveable Bridge to Airport Area**

This bridge would start at Tongass Avenue near the existing airport ferry terminal, rise along the hillside behind the quarry, turn westward, cross over Tongass Avenue and Tongass Narrows, and then turn northward just east of the airport to parallel the airport runway as it descends on Gravina Island. The bridge would incorporate a lift span over the main channel, would be about 0.5 mile long, and would have a horizontal clearance of 750 feet. Its vertical clearance would be 120 feet in the closed position and 210 feet in the open position. The roadway would terminate at the boundary between the Airport Reserve zone and the Airport Development zone north of the airport, and would include an exit to the airport terminal. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$245 million.

#### **2.2.1.6 Option F1 Cable-Stayed—High-Level, Cable-Stayed East Channel Bridge and Low-Level West Channel Bridge via Pennock Island**

Under this option, the roadway would start at Tongass Avenue just north of the cemetery, rise along the hillside behind the cemetery and the USCG Station, turn westward, and cross over Tongass Avenue and the East Channel to Pennock Island. The roadway would cross Pennock Island at grade. A second bridge would then extend over the West Channel to Gravina Island. The roadway would extend northward to the airport, parallel the runway to the east of the runway, and terminate at the airport terminal. The East Channel bridge would be a high-level, cable-stayed bridge about 0.8 mile long, with a vertical clearance of 210 feet and a horizontal clearance of 750 feet. The West Channel bridge would be about 0.4 mile long, with a vertical clearance of 120 feet and a horizontal clearance of 525 feet. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$205 million (see Section 2.3.6 for the discussion regarding the increased cost ceiling). In addition, DOT&PF determined that the cable-stayed design is not reasonable because it would present extreme adverse risk to float plane operations in the vicinity of East Channel.

### **2.2.2 Tunnel Options**

The following paragraphs describe the two tunnel options that were initially developed for the Gravina Access Project but were determined not to be reasonable and eliminated from further consideration based on cost factors. Both of these options assumed that the existing airport ferry service would be discontinued.

#### **2.2.2.1 Option E—Tunnel from Jefferson Street**

This option would start above ground at Tongass Avenue and Jefferson Street next to the Plaza Mall, descend below the water surface, cross Tongass Narrows via a sunken tube tunnel, resurface 0.8 mile south of the airport on Gravina Island, turn northward and parallel the airport runway on the east, and terminate at the airport terminal. The tunnel would include a pedestrian walkway and special monitoring and other safety features. The tunnel length would be about 1.3 miles; the ship channel above the tunnel would be 750 feet wide, and would provide a minimum draft of 40 feet. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$310 million.



### **2.2.2.2 Option E2—Tunnel to Airport Area North**

This option would start above ground at Tongass Avenue north of the quarry, enter the hillside in a bored tunnel, curve under Tongass Avenue, and cross under Tongass Narrows via a sunken tube tunnel, curve northward, and resurface next to the runway north of the airport terminal on Gravina Island. The tunnel would include a pedestrian walkway and special monitoring and other safety features. The tunnel length would be about 0.86 mile, including a bored length of 0.45 mile. The ship channel above the tunnel would be 750 feet wide, and would provide a minimum draft of 40 feet. The roadway would terminate at the boundary between the Airport Reserve zone and the Airport Development zone north of the airport, and would include an exit (loop road) to the airport terminal. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$400 million.

### **2.2.3 Tunnel-and-Bridge Option**

The following paragraph describes a tunnel-and-bridge option that was initially developed for the Gravina Access Project, but was determined not to be reasonable and eliminated from further consideration in the screening process based on cost factors. This option assumed that the existing airport ferry service would be discontinued. Vertical and horizontal clearances indicate the dimensions of the primary navigational opening for the bridge.

**Option F2—Tunnel under East Channel and Low-Level West Channel Bridge via Pennock Island.** This option would start at Tongass Avenue just south of the USCG Station, descend in an arc through the hillside east of Tongass Narrows, loop around to the west, and cross under the East Channel in a sunken tube. The alignment would resurface on Pennock Island, cross Pennock Island at grade, then cross West Channel with a low-level bridge to Gravina Island. The roadway would extend northward and terminate at the airport terminal. The tunnel would include a pedestrian walkway and special monitoring and other safety features. The tunnel length would be about 1.8 miles; the ship channel above the tunnel would be 750 feet wide, and would provide a minimum draft of 40 feet. The bridge would be about 0.4 mile long, with a vertical clearance of 120 feet and a horizontal clearance of 525 feet. This alternative was determined not to be reasonable based on its 50-year life-cycle cost, which was estimated to be approximately \$595 million.

### **2.2.4 Ferry Option**

The following paragraph describes a ferry option that was initially developed for the Gravina Access Project. This option assumed that the existing airport ferry service would continue to operate at its current location and under its current schedule.

**Option G1—Ferry from Refuge Cove.** This option would provide ferry service between Mile 8.5 of Tongass Avenue near Refuge Cove on Revillagigedo Island and about 2.8 miles north of the airport on Gravina Island. It would include two new ferry vessels, a new ferry terminal on Revillagigedo Island, and a new ferry terminal on Gravina Island. The schedule of the new ferry service would be similar to that of the existing ferry service: one vessel would operate during the winter (16 hours per day, crossing every 30 minutes), and both vessels would operate during the summer (also 16 hours per day, crossing every 15 minutes). This alternative was determined not to be reasonable based on land use constraints, potential environmental

impacts, and its inability to address the need for improved access to the airport (see Section 2.3.1).

## 2.3 DETERMINATION OF REASONABLE ALTERNATIVES: A BRIEF HISTORY

According to the Council on Environmental Quality (CEQ), the project alternatives considered reasonable under NEPA are those alternatives that are *practical or feasible from a technical and economic standpoint and using common sense*.<sup>2</sup> The identification of the reasonable alternatives for the Gravina Access Project began with a screening process, developed in conjunction with state and federal resource agencies. The screening process resulted in a preliminary list of reasonable alternatives for the project. Additional technical studies and community and agency input resulted in the identification of other alternatives that were considered reasonable for the project.

### 2.3.1 Screening Process

During the summer and fall of 2000, the project team, with input from local, state, and federal agencies (including the broadly based Project Development Team [PDT]), established and conducted a screening process to evaluate the 18 initial build options (see Figure 2.1) for reasonableness. (The No Action option was to be carried forward as a project alternative in accordance with NEPA, regardless of its outcome in the screening process.) The screening process examined each option and evaluated it in terms of four categories of factors:

- ◆ Consistency with the purpose of and need for the project (as stated in Chapter 1)
- ◆ Potential environmental effects
- ◆ Potential transportation-related effects
- ◆ Estimated costs

The factors in each of these categories are listed in Table 2-2.

TABLE 2-2  
FACTORS FOR SCREENING OF OPTIONS

<i>Cost</i>	<i>Purpose and Need</i>	<i>Environmental</i>	<i>Transportation</i>
Total project costs	Reliability of access (hours of operation, vehicle restrictions, closures)	Impacts on natural resources (subtidal habitat, anadromous streams, essential fish habitat, eelgrass beds, estuaries, wetlands) from project construction	Impacts on vehicular traffic during project construction
Annual O&M costs	Efficiency and convenience of access to Gravina Island lands (travel time to developable land)	Impacts on natural resources from project operation	Impacts on marine navigation during project construction
50-year life-cycle costs	Convenience (travel distance)	Right-of-way within a Section 4(f) property	Impacts on marine navigation during project operation
	Convenience to airport (travel time)	Impacts on land use	Impacts on aviation during project construction
		Aesthetic impacts	Impacts on aviation during project operation
		Impacts on subsistence	

<sup>2</sup>Ibid.

The project team used these categories of factors to quantitatively represent each option, based on the best available information, including the many extensive technical studies conducted for the project. The objective was to screen out those options that were not reasonable alternatives.

An important screening factor in this evaluation was cost. Based on a 50-year project life, the DOT&PF determined the practical limit of project funding to be a life-cycle cost of \$150,000,000.<sup>3</sup> The early cost estimates developed for the 18 initial build options are provided in Table 2-3.

**TABLE 2-3  
EARLY COST ESTIMATES FOR 18 INITIAL BUILD OPTIONS**

<i>Alternative</i>	<i>50-year Life-cycle Cost (\$million)</i>
A	260
B	370
C1	235
C2	200
C3	140
C4	150
D1	85
D2	245
E	310
E2	400
F1	200
F1 Cable-Stayed	205
F2	595
F3	180
G1	155
G2	150
G3	130
G4	130

Eleven options were considered by DOT&PF to not be reasonable because they had 50-year life-cycle costs substantially beyond \$150,000,000. The options screened out from the pool of potential reasonable alternatives based on this cost ceiling were:

- ◆ Four high-level bridges (Options A, B, C1, and C2)
- ◆ The moveable bridge (Option D2)
- ◆ The tunnels (Options E and E2)

<sup>3</sup> Joseph Perkins, P.E., DOT&PF Commissioner, August 29, 2000, concurrence on memorandum from Patrick Kemp, P.E., Preconstruction Engineer, DOT&PF Southeast Region, August 29, 2000.

- ◆ The four alignments across Pennock Island (Options F1, F1 cable-stayed, F2, and F3)

Closer review of the seven remaining project options (i.e., Options C3, C4, D1, G1, G2, G3, and G4), using the environmental and transportation factors, revealed that Option G1 would not be practical or feasible from a technical standpoint. The Option G1 ferry terminal on Revillagigedo Island would be near Refuge Cove, which would require the taking of several homes and a Section 4(f) property (Refuge Cove State Park).<sup>4</sup> The DOT&PF investigated relocating the ferry terminal to avoid Refuge Cove State Park; however, a more acceptable location could not be identified because of land use constraints (residential, commercial, and industrial developments to the north and south), environmental constraints (reef and island areas off the Revillagigedo Island shoreline), or the impracticalities associated with increasing the over-water ferry travel time (i.e. by locating the terminal in Ward Cove). Because of the difficulties with the Option G1 ferry terminal location on Revillagigedo Island and because this option would not improve the travel time to the airport for any user, Option G1 was determined to be not a reasonable alternative and was not recommended for further study.

Following the elimination of Options A, B, C1, C2, D2, E1, E2, F1, F1 cable-stayed, F2, and F3 because they exceeded the cost ceiling, and the elimination of Option G1 because of its impacts to a Section 4(f) property, no other options were determined to be unreasonable in the screening process. Therefore, the DOT&PF recommended the following as reasonable alternatives for the Gravina Access Project: C3, C4, D1, G2, G3, G4, and No Action.

### **2.3.2 Local Government and Community Input**

Concurrent with the DOT&PF's screening process during the fall of 2000, the Borough and the cities of Ketchikan and Saxman were engaged in discussions pertaining to the identification of reasonable alternatives for the Gravina Access Project. The Borough's Department of Planning and Community Development (Planning Department) provided an independent evaluation of the alternatives based on the DOT&PF screening process, and based on the Planning Department's knowledge of local planning issues and constraints. The purpose of this effort was to assist the Borough Assembly and the city councils of Ketchikan and Saxman in making a recommendation (or independent recommendations) to the DOT&PF for the reasonable alternatives that should be studied further in the EIS.

The Planning Department's evaluation concluded that, in addition to No Action, the following options deserved further study: C3, C4, D1, a "revised" G4<sup>5</sup>, and F3.<sup>6</sup> The Planning Department included Option F3, even though its estimated 50-year life-cycle costs exceeded the DOT&PF's \$150 million cost ceiling, because of its potential advantages:

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<sup>4</sup> Section 4(f) of the U.S. Department of Transportation Act of 1966 states: The Administration may not approve the use of land from a significant publicly owned public park, recreation area or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that: (1) there is no feasible and prudent alternative to the use of land from the property and (2) the action includes all possible planning to minimize harm to the property resulting from such use.

<sup>5</sup> Under this option, the community would expand and improve the existing ferry route as demand and availability of local financial resources made it appropriate. Improvements could include certain services such as baggage handling, improved terminal facilities and vessels, and expanded frequency of service.

<sup>6</sup> Stephen Reeve, Principal Planner, and John Hill, Associate Planner, Ketchikan Gateway Borough Planning Department, memorandum to Members of the Planning Commission, September 6, 2000.

- ◆ It would provide access to substantial amount of Borough and private lands on Gravina Island south of the airport and on Pennock Island;
- ◆ It would place bridge structures in locations that would have less of an impact on float plane and airport operations than other bridge options;
- ◆ It would enable large vessels to continue to traverse Tongass Narrows (via West Channel); and
- ◆ It would have less of an impact on the availability of developable lands adjacent to the airport than other bridge options.

The Planning Commission held two public work sessions in its effort to reach a recommendation to the Borough Assembly. Based on the Planning Department's evaluation, the testimonies of many individual citizens, and the contributions of the DOT&PF, the Planning Commission issued Resolution No. 2631, which recommended the following options for the Gravina Access Project: C3, C4, a "revised" G4, and No Action.<sup>7</sup> The Planning Commission chose not to recommend advancing Option F3 because of the possible impacts it might have on vehicular traffic through downtown Ketchikan and the resultant inconvenience of access to many Ketchikan residents. The Commission also considered the likely impacts Option F3 would cause the Pennock Island neighborhood, which has voiced opposition to roaded access.<sup>8</sup>

Members of the Borough Assembly, Ketchikan City Council, and Saxman City Council met at a joint work session on October 17, 2000, to discuss the Gravina Access Project options with Borough staff and representatives from the DOT&PF. The joint work session was an opportunity for these and other members of the public to participate in the local review process and provide input to the recommendations being developed by the three local governing bodies.

On November 6, 2000, the Ketchikan Gateway Borough Assembly passed Resolution No. 1578 supporting further investigation of the following options: C3, C4, D1, F3, and G4. This resolution was forwarded to the city councils of Ketchikan and Saxman for their approval. The City Council of Ketchikan concurred with the Assembly's resolution on November 16, 2000. The City Council of Saxman, in Resolution No. 01-11-232 (November 8, 2000) recommended the following options for further study: C3, C4, D1, F1, G4, and No Action. The resolution gave no explanation for the substitution of Option F1 for Option F3.

### **2.3.3 DOT&PF Identification of Alternatives**

The DOT&PF considered the results of its screening process, as well as the input from the local governments and Ketchikan Gateway Borough community, in determining which options should be considered reasonable alternatives for the Gravina Access Project and studied further in the EIS. Because the Borough Assembly felt strongly that Option F3 should be included, the DOT&PF increased the cost ceiling to \$175 million to accommodate the Assembly and include

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<sup>7</sup> Stephen Reeve, Principal Planner, and John Hill, Associate Planner, through Susan Dickinson, Planning Director, and Georgianna Zimmerle, Borough Manager, Ketchikan Gateway Borough Planning Department, memorandum to Mayor Jack Shay and Members of the Borough Assembly, Mayor Dan Williams and Members of the Saxman City Council, and Mayor Bob Weinstein and Members of the Ketchikan City Council, October 10, 2000.

<sup>8</sup> Ibid.



F3.<sup>9</sup> The DOT&PF reviewed the costs of all previously considered build options that had been eliminated due to their costs and determined that, other than Option F3, none of those options would be considered reasonable with this revised cost ceiling. Therefore, the DOT&PF identified the following as reasonable project alternatives: C3, C4, D1, F3, G2, G3, and G4. The No Action option was also retained for further study as the No Action Alternative.

In December 2000, the project team presented these eight alternatives (i.e., Alternatives C3, C4, D1, F3, G2, G3, and G4, and the No Action Alternative) to the PDT as the recommended alternatives to be studied in detail in the NEPA document. In January 2001, these alternatives were forwarded to state and federal agencies for formal concurrence under the interagency NEPA and Section 404 merger agreement<sup>10</sup>. By March 2001, the DOT&PF received letters of concurrence from all participating agencies, with the exception of the Alaska Department of Environmental Conservation and the Alaska Division of Governmental Coordination, which selected “nonparticipation by choice.” Based on the lack of any agency nonconcurrence, Alternatives C3, C4, D1, F3, G2, G3, and G4, and the No Action Alternative became the reasonable alternatives for the proposed action.

### **2.3.4 Additional Technical Studies**

During the spring of 2001, the project team initiated a series of engineering analyses to further refine the preliminary engineering of the reasonable alternatives. These analyses were undertaken principally to:

- ◆ Refine roadway designs
- ◆ Evaluate structural requirements of bridges (including navigational clearances)
- ◆ Revise cost estimates to reflect design changes

As a result of the additional engineering work, the conceptual designs for several of the bridge alternatives were altered slightly, and a variation of one bridge alternative was added to the list of reasonable alternatives. These changes are described as follows:

**Vertical Clearance.** The 210-foot vertical clearances of three bridges (in Alternatives C3, C4, and F3) were reconfigured as 200-foot vertical clearances. This reconfiguration is consistent with the vertical clearances of other major structures along the west coast,

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<sup>9</sup> Patrick Kemp, P.E., Preconstruction Engineer, through Michael Dowling, P.E., Director of Design and Engineering Services, DOT&PF Southeast Region, memorandum to Joseph Perkins, P.E., DOT&PF Commissioner, November 29, 2000.

<sup>10</sup> In April 1997, the DOT&PF and FHWA Alaska Division entered into a “Interagency Working Agreement to Integrate Section 404 and Related Permit Requirements into the National Environmental Policy Act” with the Alaska Department of Fish and Game, Alaska Department of Environmental Conservation, Alaska Department of Natural Resources, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. The agreement integrated the Clean Water Act Section 404(b)(1) Guidelines and other Section 404-related permitting and certification requirements with the NEPA process. Signatories of the agreement committed to ensure the earliest possible identification and consideration of environmental concerns to waters of the United States (including wetlands) in the planning, design, and construction of federal-aid highway projects.

The merged process for the Gravina Access Project was to have three concurrence points: purpose and need; reasonable alternatives to be carried forward for the NEPA document; and the preferred alternative. The agreement expired in May 2002 and was not renewed; therefore, the concurrence process is no longer applicable to the Gravina Access Project.

such as the Seymour Narrows cable crossing (185 feet) and Lion's Gate Bridge (200 feet) in Vancouver, British Columbia.

**Horizontal Clearance.** The horizontal clearances used in early investigations were determined using the conceptual channel design methods published by the Permanent International Association of Navigation Congresses (PIANC)<sup>11</sup>. For the initial 210-foot high bridge options, a horizontal clearance of 750 feet was assumed as a conservative width to provide for two-way traffic of the largest cruise ships potentially transiting Tongass Narrows. Further investigation of cruise ship traffic in Tongass Narrows determined that cruise ships coordinate the timing of their transits to avoid two-way traffic in Tongass Narrows. Accordingly, the horizontal clearances of the 200-foot high bridges associated with Alternatives C3, C4, and F3 were reconfigured to 550 feet, based on the PIANC conceptual method.

**New Alternative—C3(b).** A new bridge alternative with a vertical clearance of 120 feet was added in the same general location as Alternative C3. This alternative was added to provide a low-level bridge that, after crossing Tongass Narrows, would connect more directly to the airport terminal area than the 120-foot bridge of Alternative D1. Alternative C3 (with a 200-foot bridge) was redesignated C3(a), and the new 120-foot bridge alternative at that location was designated Alternative C3(b). The alignment of this alternative is shown in Figures 2.2 and 2.7.

**D1 and G2 Changes.** In their original configuration, Alternatives D1 and G2 wrapped around the northern end of the airport property. With the DOT&PF's plans to extend the airport's west taxiway to the north (which had been approved by federal and state natural resource agencies after extensive consultation) and is currently under construction, the prism of the northern roadway alignment for Alternatives D1 and G2 would have to be pushed further into Tongass Narrows. Preliminary engineering and environmental studies indicated that this would require placement of substantial amounts of fill in Tongass Narrows, which would result in unacceptable environmental impacts to intertidal areas and other sensitive habitat. These studies, together with input from federal and state agencies, indicated that a southern route around the airport was the only reasonable location of this roadway. Alternatives D1 and G2 were therefore reconfigured to wrap around the southern end of the airport runway, in the same alignment as the other build alternatives.

**Spine Road Added to All Alternatives.** In their original configuration, all build options provided access to developable land on Gravina Island either by making landfall outside of the Airport Reserve zone (i.e., access to developable land would be possible along the alignment in its approach to the airport), or with an additional road segment extending from the airport to the closest developable land. During the development of Gravina Access Project alternatives, the Borough was planning development of a new road around the west side of the airport to the Lewis Reef development area (i.e., Proposed Ketchikan Airport Access Road identified on Figure 2.2). After identification of the reasonable alternatives and additional coordination with the Borough concerning their long-term plans for development on Gravina Island and the road to the Lewis Reef

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<sup>11</sup> The conceptual channel width design is based upon a historical survey of ships that have passed through Tongass Narrows, projections of the type of ships anticipated to use the channel in the future, factors for channel bottom type and depth, visibility, and type of channel navigational aids.

development area, the DOT&PF determined that all build alternatives should provide access to the developable land north of the Airport Reserve zone, consistent with the road planned by the Borough. Therefore, all build alternatives were revised to include construction of a road around the west side of Ketchikan International Airport. This road, located entirely on airport property, crosses Airport Reserve Land (land reserved for airport specific uses) and ends at the intersection with Airport Development Land (land more generally available for all types of development, not necessarily airport related). It provides uniform access among all build alternatives to developable property north of the airport, addressing the related portion of the purpose and need for the project.

The evaluation of each build alternative includes effects resulting from construction and operation of this road. The road is designed to provide vehicular and other access to the area of Gravina Island, north of the airport, where the Borough has encouraged land development such as the long-term lease to Pacific Log and Lumber.

Based on the refined engineering design of the alternatives, the project team conducted specialized technical studies of the reasonable alternatives (i.e., Alternatives C3[a], C3[b], C4, D1, F3, G2, G3, and G4) during the spring and fall of 2001 to characterize the potential environmental impacts associated with each. These studies were:

- ◆ Evaluation of Impacts to the Social Environment
- ◆ Assessment of Relocation Impacts
- ◆ Assessment of Economic Impacts
- ◆ Visual Quality Impact Assessment
- ◆ Assessment of Impacts to the Biological Environment
- ◆ Historic and Archaeological Resources Survey
- ◆ Aviation Impacts Analysis
- ◆ Assessment of Airport Impacts
- ◆ Marine Navigation Analysis
- ◆ Traffic Impact Assessment
- ◆ Hazardous Wastes Study
- ◆ Secondary and Cumulative Impacts Analysis

The results of the engineering and environmental technical studies were compiled into the *Alternatives Evaluation Summary Report*.<sup>12</sup> The principal impact issues identified in these analyses were navigation, aviation and the airport, project costs, economic conditions, and natural resources.

**Navigation.** Bridge clearances (both vertical and horizontal) and locations would affect ship passage under the bridge and maneuvers through Tongass Narrows. The bridge

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<sup>12</sup> DOT&PF, prepared by HDR Alaska, January 2002

alternatives would introduce a greater probability of ship groundings and a higher risk of collisions (i.e., ship collisions with bridge piers).

**Aviation and the Airport.** Analysis indicated likely delays to floatplanes flying under special visual flight rules (SVFR), particularly for the bridge alternatives nearest the airport (C3[a], C3[b], C4, and D1). Ferry operations, bridge piers, and bridge construction would alter floatplane operations. The two highest bridge alternatives near the airport (C3[a] and C4) would penetrate the Part 77 airspace, a Federal Aviation Administration (FAA)-designated clear zone around the airport.

**Costs.** The life-cycle costs were estimated to be between \$110,000,000 and \$170,000,000 for the bridge alternatives (using a bridge life of 75 years), and between \$105,000,000 and \$110,000,000 for the ferry alternatives (using a ferry life of 50 years). The annual operation and maintenance (O&M) costs were estimated to be between \$116,000 and \$270,000 for the bridge alternatives, and between \$4,460,000 and \$4,500,000 for the ferry alternatives.

**Economics.** Spending associated with project construction would raise employment in the Borough by an estimated 261 to 1,416 persons employed, depending upon the alternative. With the bridge alternatives, cruise ships would have to change their operations and might have to eliminate or shorten some port calls, which could reduce economic activity in the Borough.

**Natural Resources.** All build alternatives would adversely affect Tongass Narrows, streams, wetlands, and/or forests by altering or eliminating some fish and wildlife habitat.

### **2.3.5 Preliminary Identification of Recommended Alternative**

Based on the results of the engineering and environmental technical studies, the DOT&PF identified Alternative F3, the two-bridge alternative that traverses Tongass Narrows via Pennock Island, as its recommended alternative for the Gravina Access Project. The principal reasons supporting DOT&PF's recommendation was that Alternative F3 would:

- ◆ Meet the project's purpose and need.
- ◆ Meet the community's goal of bridge access to Gravina Island.
- ◆ Allow the passage of major cruise ships, thereby maintaining Ketchikan's tourism industry.
- ◆ Better serve Ketchikan's long-term needs for convenient and reliable transportation to the airport and developable land, compared to the ferry alternatives.
- ◆ Not intrude into Ketchikan International Airport airspace.
- ◆ Have a minimal impact on airport facilities, compared to the other bridge alternatives located at the airport.
- ◆ Have less potential impact on Ketchikan's floatplane industry than the other bridge alternatives (which are located at the airport).
- ◆ Have bridge structures that are not as technically challenging as the other bridge alternatives.

- ◆ Have bridge structures that would be less visibly intrusive than the other bridge alternatives.

Although DOT&PF viewed Alternative F3 as its recommended alternative, it recognized the particular challenges associated with this crossing:

- ◆ The crossing point would not be central to Ketchikan's population center.
- ◆ Traffic from north of Ketchikan would be routed through the downtown core.
- ◆ Cruise ships would be directed through the West Channel, where maneuvers to the city docks would be more inconvenient and riskier than are the current maneuvers in the East Channel.
- ◆ Some cruise lines have expressed reservations about calling in Ketchikan through the West Channel; such reduced cruise ship calls would potentially reduce cruise-related spending. Mitigation for this economic impact might involve moving the cruise ship docking locations. Community coordination with cruise line agencies would be essential for successfully maintaining and, if desired, growing Ketchikan's important tourist industry.
- ◆ Full funding for construction might be difficult to obtain.

### **2.3.6 Addition of Alternative F1 (Preferred)**

On January 7, 2002, Governor Tony Knowles and DOT&PF Commissioner Joe Perkins publicly announced the recommendation for Alternative F3. The DOT&PF held public open house meetings in Ketchikan on February 11 and 27, 2002, to obtain public input regarding this decision. The DOT&PF also held meetings with federal, state, and local agencies and public officials in January, February, and March 2002. During this time, DOT&PF received considerable input from the community, elected officials, and representatives of local, state, and federal agencies concerning the reasonable alternatives.

Many of the commenters supported a Pennock Island crossing (such as Alternative F3). However, there was a great deal of public interest in and preference for an alternative with a 200-foot high bridge over East Channel (instead of over West Channel) to allow passage of cruise ships and a lower (120-foot-high) bridge over West Channel. Such a configuration is essentially Option F1 from the initial set of options, as described in Section 2.3.1. In the screening of initial options, Option F1 had been determined to be unreasonable solely on the basis of its cost, which would have exceeded the DOT&PF's established cost ceiling. The community support of Option F1 was based primarily on concerns for restricting cruise ship travel to West Channel under Alternative F3 and the potential impacts to the local economy as a result of fewer and shorter cruise ship port calls.

In the spring of 2002, the DOT&PF received indication from the Alaska Congressional delegation that federal funding for the Gravina Access Project was feasible at a level above \$190 million, and that the \$175 million cost ceiling could be increased to allow the consideration of Option F1 as a reasonable alternative.



As stated in Section 2.2, the cost estimates of the initial 18 alternatives are not directly comparable with the current estimates of the reasonable alternatives. The DOT&PF reviewed the costs of all previously considered build options that had been eliminated due to their costs and determined that Options A, B, C1, D2, E, and E2 still had costs above the reasonable range (i.e., total project costs in excess of \$240 million); therefore, based on costs, DOT&PF determined that no further investigations of Options A, B, C1, D2, E, or E2 were required. Although Option C2 could now be considered reasonable from a cost standpoint, DOT&PF did not add it to the list of reasonable alternatives because it is almost identical to Alternative C4, the primary difference being its horizontal navigational opening, which is 750 feet. Since engineering studies conducted in Spring 2001 indicated that a navigational opening of 550 feet would be adequate (see Section 2.3.4), there was no need to add Option C2 to the list of reasonable alternatives. Although Option F1 cable-stayed could now be considered reasonable from a cost standpoint, DOT&PF did not add it to the list of reasonable alternatives because it would be the same footprint as Alternative F1 and the cable-stayed design would present extreme adverse risk to float plane operations in East Channel.

Based on strong local support for Option F1 combined with federal funding assurances, the DOT&PF decided to add Alternative F1 as a reasonable alternative to be evaluated in this EIS,<sup>13</sup> with modification of the vertical and horizontal navigational clearances of the East Channel bridge to 200 feet and 550 feet, respectively. This brought to nine the number of build alternatives being evaluated.

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<sup>13</sup> Joseph Perkins, P.E., DOT&PF Commissioner, April 30, 2002. Concurrence on memorandum from Patrick Kemp, P.E., Preconstruction Engineer, through Bob Doll, Regional Director, DOT&PF Southeast Region, April 22, 2002.